the internal structure of the seeds, especially the smaller seeds, might help to connect the Cordaitales with the Pteridophytes.

The fact that the geographical distribution of plants at different stages in the development of the earth receives only disconnected treatment is excused by the plea that the space needed for Vols. III and IV (now in press) was underestimated, the original plan providing for a treatment of geographical distribution at the end of Vol. IV. However, SEWARD promises an entire volume devoted to this subject. Such a work would be welcomed by all students of morphology and phylogeny, and we hope that the volume will make its appearance at an early date.

The complete bibliography and index, together with the critical and conservative presentation of the entire subject, make the work indispensable to those engaged in research upon fossil plants.—C. J. CHAMBERLAIN.

NOTES FOR STUDENTS

Chlorophyll inheritance.—This subject seems to be a stumbling-block both for plant geneticists and cytologists. In 1913 EMERSON and EAST[2] stated that there were on record only two indisputable cases of non-Mendelian inheritance. Both of these were cases of chlorophyll inheritance. CORRENS[3] made reciprocal crosses of a variegated *Mirabilis* (*albomaculata*) with normal green plants, and discovered that in this case inheritance was strictly maternal, the pollen evidently contributing nothing. He explained this by assuming that the variegation was due to a disease of the cytoplasm which destroyed many of the chloroplasts, and that nuclei were immune to this disease. Thus the disease could be transmitted to progeny by the female parent only, since the male is supposed by cytologists to contribute only a nucleus stripped free from its cytoplasm. If one grants CORRENS' assumptions, the mechanism provided will explain this case of maternal inheritance without any violation of MENDEL'S law, for here there would be no true inheritance, but merely reinfection.

BAUR,[4] working with a *Pelargonium* which had white-margined leaves, observed an occasional pure green branch and an occasional pure white branch. Flowers on these branches when self-fertilized gave respectively pure green and pure white progeny (the latter, of course, dying in the seedling stage). A cross either way between the two branches resulted in progeny which were a mosaic of green and white. Such behavior can be accounted for by either of two explanations, but each involves a very bold assumption. If there is a Mendelian determiner responsible for the full green development, and a white

[2] EMERSON, R. A., and EAST, E. M., Inheritance of quantitative characters in maize. Bull. Agric. Exper. Sta. Nebr. no. 2. pp. 120. *figs. 21.* 1913.

[3] CORRENS, C. E., Zeitschr. Ind. Abstamm. Vererb. 2:331–340. 1909.

[4] BAUR, ERWIN, Zeitschr. Ind. Abstamm. Vererb. 1:330. 1909.

plant lacks that determiner, it would not be an unheard-of thing for a cross between the two to show a mosaic (particulate inheritance). But for pure green and pure white branches to form and breed true sexually would involve somatic segregation. Such an explanation is hard to accept, since we have been confident not only that no general reduction division ever takes place in somatic tissue, but also that segregation in individual pairs of chromosomes or parts of chromosomes is impossible elsewhere than at spore formation. We might accept such a possibility for very rare monstrosities, but the case in hand seems to be a matter of fairly regular behavior. Mutation might also account for these results, but this too could hardly be expected to take place with such regularity.

The other explanation seemed much more reasonable to BAUR, but that too he acknowledged to be unorthodox. He assumed that this was not a matter of chromosomes but of plastids, and of course somatic segregation of green and white plastids is quite reasonable. If this mechanism be the true one, however, one must also grant that plastid initials are contributed by the male parent. This last is quite unorthodox and seems flatly contradictory of CORRENS' ideas, for if enough cytoplasm is contributed by the male to introduce plastid initials, why should it not also contribute the diseased condition of CORRENS' *albomaculata?*

IKENO,[5] working on variegated races of *Capsicum*, confirms BAUR'S qualitative results, and makes the case still stronger by uncovering some very significant quantitative features. "The offspring arising from the hybridization between a variegated and a green plant in either of two reciprocal ways contain a relatively far larger number of slightly variegated (less white) plants than those arising from the self-fertilization of the same variegated plant." The intensity of variegation may be progressively diminished by repeated crosses with green plants, but not even a single self-colored green has as yet been obtained in that way. IKENO concludes that the transmission of variegation is not through the nucleus, but through the plastids in the cytoplasm; the male contributes cytoplasm and plastids.

It seems impossible to reconcile this behavior with CORRENS' maternal inheritance. To assume that plastid initials originate within the nucleus might smooth over the immediate difficulty, and would carry us into further complications. A more hopeful suggestion is that the disease which CORRENS speaks of attacks only mature chloroplasts and that plastid initials are immune, as well as the cytoplasm around them. The easiest assumption, of course, would be to claim that CORRENS overlooked a case of apogamy. Otherwise we may be driven to acknowledge that chlorophyll inheritance in angiosperms is governed by at least two mechanisms, which are not only quite different but directly contradictory.—MERLE C. COULTER.

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[5] IKENO, S., Studies on the hybrids of *Capsicum annuum*. II. On some variegated races. Jour. Genetics 6:201–229. *pl. 8. figs. 1, 2.* 1917.